JavaOne℠

Hacking JavaFX with Groovy, Clojure, Scala, and Visage

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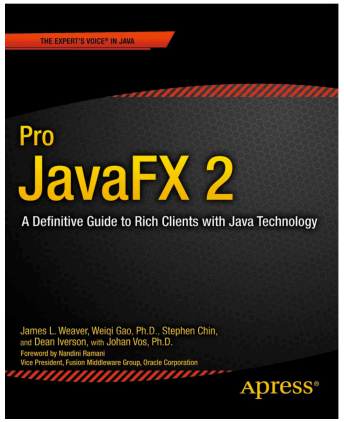
Meet the Presenter

Stephen Chin

- Java Evangelist, Oracle
- Author, Pro JavaFX Platform 2
- Open Source Hacker
  - JFXtras
  - ScalaFX
  - Visage
- User Group Co-Leader
  - Silicon Valley JavaFX User Group
  - Streamed Live!



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JavaFX 2.0 Platform

Immersive Application Experience

Leverage your Java skills with modern JavaFX APIs

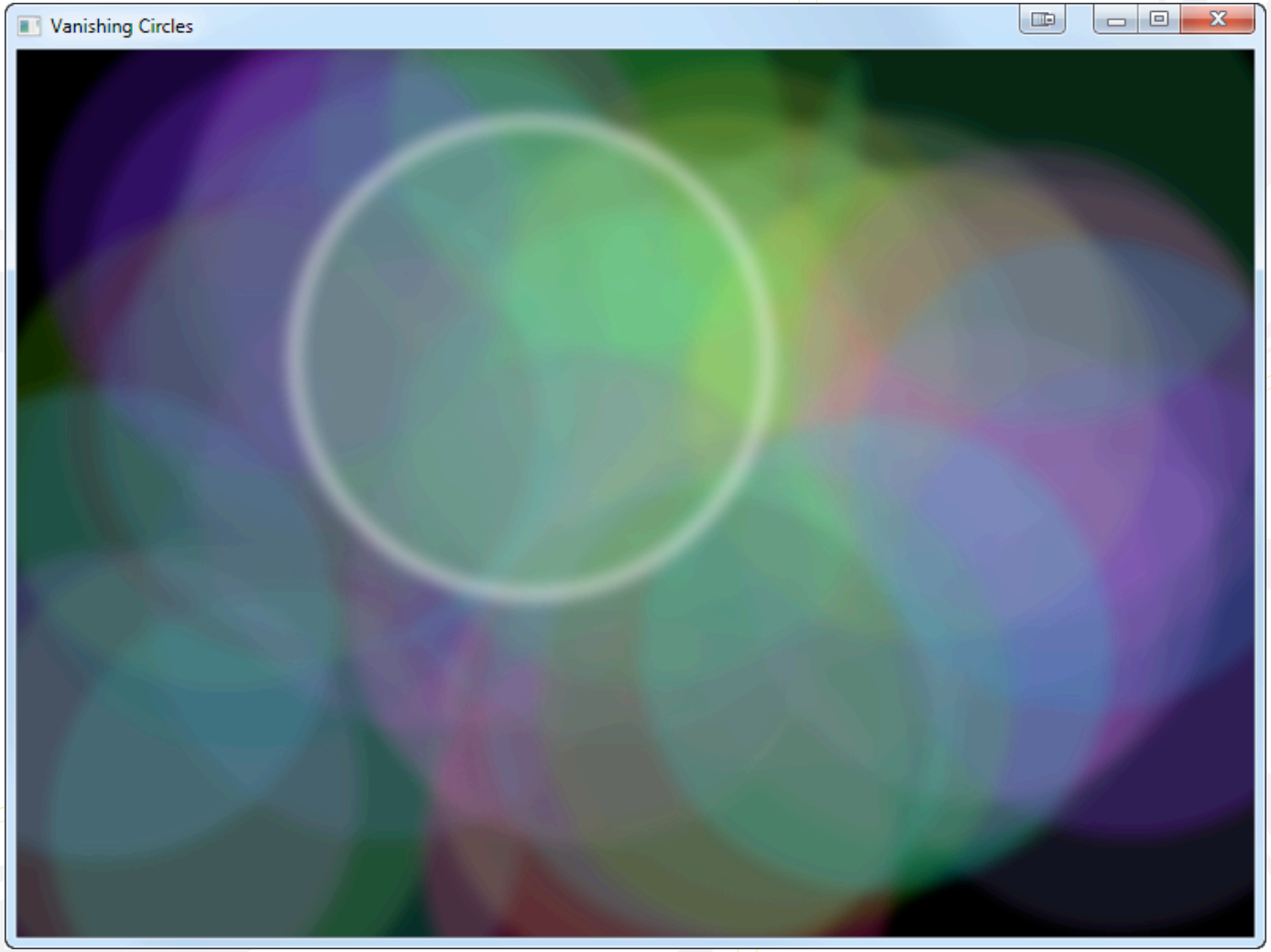
- Cross-platform Animation, Video, Charting
- Integrate Java, JavaScript, and HTML5 in the same application
- New graphics stack takes advantage of hardware acceleration for 2D and 3D applications
- Use your favorite IDE: NetBeans, Eclipse, IntelliJ, etc.

JavaFX With Java

Programming Languages

- JavaFX 2.0 APIs are now in Java
  - Pure Java APIs for all of JavaFX
  - Binding and Sequences exposed as Java APIs
  - FXML Markup for tooling
- Embrace all JVM languages
  - **Groovy**, **Scala**, **Clojure**, JRuby
  - Fantom, Mira, Gosu, Jython, etc.
- JavaFX Script is no longer supported by Oracle
  - Existing JavaFX Script based applications will continue to run
  - **Visage** is the open-source successor to the JavaFX Script language

Vanishing Circles



Vanishing Circles in Java

```
public class VanishingCircles extends Application {

  public static void main(String[] args) {
    Application.launch(args);
  }

  @Override
  public void start(Stage primaryStage) {
    primaryStage.setTitle("Vanishing Circles");
    Group root = new Group();
    Scene scene = new Scene(root, 800, 600, Color.BLACK);
    List<Circle> circles = new ArrayList<Circle>();
    for (int i = 0; i < 50; i++) {
      final Circle circle = new Circle(150);
      circle.setCenterX(Math.random() * 800);
      circle.setCenterY(Math.random() * 600);
      circle.setFill(new Color(Math.random(), Math.random(), Math.random(), .2));
      circle.setEffect(new BoxBlur(10, 10, 3));
      circle.addEventHandler(MouseEvent.MOUSE_CLICKED, new EventHandler<MouseEvent>() {
        public void handle(MouseEvent t) {
          KeyValue collapse = new KeyValue(circle.radiusProperty(), 0);
          new Timeline(new KeyFrame(Duration.seconds(3), collapse)).play();
        }
      });
      circle.setStroke(Color.WHITE);
      circle.strokeWidthProperty().bind(Bindings.when(circle.hoverProperty())
        .then(4)
        .otherwise(0));
      circles.add(circle);
    }
    root.getChildren().addAll(circles);
    primaryStage.setScene(scene);
    primaryStage.show();

    Timeline moveCircles = new Timeline();
    for (Circle circle : circles) {
      KeyValue moveX = new KeyValue(circle.centerXProperty(), Math.random() * 800);
      KeyValue moveY = new KeyValue(circle.centerYProperty(), Math.random() * 600);
      moveCircles.getKeyFrames().add(new KeyFrame(Duration.seconds(40), moveX, moveY));
    }
    moveCircles.play();
  }
}
```

40 Lines
1299 Characters

Application Skeleton

```
public class VanishingCircles extends Application {
  public static void main(String[] args) {
    Application.launch(args);
  }
  @Override
  public void start(Stage primaryStage) {
    primaryStage.setTitle("Vanishing Circles");
    Group root = new Group();
    Scene scene = new Scene(root, 800, 600, Color.BLACK);
    [create the circles…]
    root.getChildren().addAll(circles);
    primaryStage.setScene(scene);
    primaryStage.show();
    [begin the animation…]
  }
}
```

Create the Circles

```
List<Circle> circles = new ArrayList<Circle>();
for (int i = 0; i < 50; i++) {
  final Circle circle = new Circle(150);
  circle.setCenterX(Math.random() * 800);
  circle.setCenterY(Math.random() * 600);
  circle.setFill(new Color(Math.random(), Math.random(),
                           Math.random(), .2));
  circle.setEffect(new BoxBlur(10, 10, 3));
  circle.setStroke(Color.WHITE);
  [setup binding…]
  [setup event listeners…]
  circles.add(circle);
}
```

Setup Binding

```
circle.strokeWidthProperty().bind(Bindings
   .when(circle.hoverProperty())
   .then(4)
   .otherwise(0)
);
```

Setup Event Listeners

```
circle.addEventHandler(MouseEvent.MOUSE_CLICKED,
                       new EventHandler<MouseEvent>() {
  public void handle(MouseEvent t) {
    KeyValue collapse = new KeyValue(circle.radiusProperty(), 0);
    new Timeline(new KeyFrame(Duration.seconds(3),
                              collapse)).play();
  }
});
```

Begin the Animation

```
Timeline moveCircles = new Timeline();
for (Circle circle : circles) {
  KeyValue moveX = new KeyValue(circle.centerXProperty(),
                                Math.random() * 800);
  KeyValue moveY = new KeyValue(circle.centerYProperty(),
                                Math.random() * 600);
  moveCircles.getKeyFrames().add(new KeyFrame(Duration.seconds(40),
                                              moveX, moveY));
}
moveCircles.play();
```

JavaFX With Groovy

Features of Groovy

- Modern language
  - Closures
  - AST Transforms
  - Strongly typed dynamic language
- Tight integration with Java
  - Very easy to port from Java to Groovy
- Declarative syntax with GroovyFX Builders
  - Familiar to Groovy and JavaFX Script developers

Java vs. GroovyFX DSL

```
public class VanishingCircles extends Application {

  public static void main(String[] args) {
    Application.launch(args);
  }

  @Override
  public void start(Stage primaryStage) {
    primaryStage.setTitle("Vanishing Circles");
    Group root = new Group();
    Scene scene = new Scene(root, 800, 600, Color.BLACK);
    List<Circle> circles = new ArrayList<Circle>();
    for (int i = 0; i < 50; i++) {
      final Circle circle = new Circle(150);
      circle.setCenterX(Math.random() * 800);
      circle.setCenterY(Math.random() * 600);
      circle.setFill(new Color(Math.random(), Math.random(), Math.random(), .2));
      circle.setEffect(new BoxBlur(10, 10, 3));
      circle.addEventHandler(MouseEvent.MOUSE_CLICKED, new EventHandler<MouseEvent>() {
        public void handle(MouseEvent e) {
          KeyValue kv = new KeyValue(circle.opacityProperty(), 0);
          new Timeline(new KeyFrame(Duration.seconds(3), kv)).play();
        }
      });
      circle.setStroke(Color.WHITE);
      circle.strokeWidthProperty().bind(Bindings.when(circle.hoverProperty())
        .then(4)
        .otherwise(0));
      circles.add(circle);
    }
    root.getChildren().addAll(circles);
    primaryStage.setScene(scene);
    primaryStage.show();

    Timeline moveCircles = new Timeline();
    for (Circle circle : circles) {
      KeyValue moveX = new KeyValue(circle.centerXProperty(), Math.random() * 800);
      KeyValue moveY = new KeyValue(circle.centerYProperty(), Math.random() * 600);
      moveCircles.getKeyFrames().add(new KeyFrame(Duration.seconds(40), moveX, moveY));
    }
    moveCircles.play();
  }
}
```

40 Lines
1299 Characters

```
GroovyFX.start { primaryStage ->
  def sg = new SceneGraphBuilder()
  def rand = new Random().&nextInt
  def circles = []

  sg.stage(title: 'Vanishing Circles', show: true) {
    scene(fill: black, width: 800, height: 600) {
      50.times {
        circles << circle(centerX: rand(800), centerY: rand(600), radius: 150, stroke: white,
                strokeWidth: bind('hover', converter: {val -> val ? 4 : 0})) {
          fill rgb(rand(255), rand(255), rand(255), 0.2)
          effect b
          onMouseClicked { e ->
            timeli
              at(3
              }.play()
          }
        }
      }
    }

    timeline(cycle
      circles.each { circle ->
        at (40.s) {
          change circle.centerXProperty() to rand(800)
          change circle.centerYProperty() to rand(600)
        }
      }
    }.play()
  }
}
```

29 Lines
671 Characters

```
GroovyFX.start { primaryStage ->
  def sg = new SceneGraphBuilder()
  def rand = new Random().&nextInt
  def circles = []

  sg.stage(title: 'Vanishing Circles', show: true) {
    scene(fill: black, width: 800, height: 600) {
      50.times {
        circles << circle(centerX: rand(800), centerY: rand(600),
            radius: 150, stroke: white,
            strokeWidth: bind('hover', converter: {val -> val ? 4 : 0})) {
          fill rgb(rand(255), rand(255), rand(255), 0.2)
          effect boxBlur(width: 10, height: 10, iterations: 3)
        }
      }
    }
  }
}
```

```
GroovyFX.start { primaryStage ->
  def sg = new SceneGraphBuilder()
  def rand = new Random().&nextInt
  def circles = []

  sg.stage(title: 'Vanishing Circle
    scene(fill: black, width: 800,
      50.times {
        circles << circle(centerX: rand(800), centerY: rand(600),
            radius: 150, stroke: white,
            strokeWidth: bind('hover', converter: {val -> val ? 4 : 0})) {
          fill rgb(rand(255), rand(255), rand(255), 0.2)
          effect boxBlur(width: 10, height: 10, iterations: 3)
        }
      }
    }
  }
}
```

Builder for GroovyFX scene graphs

```
GroovyFX.start { primaryStage ->
  def sg = new SceneGraphBuilder()
  def rand = new Random().&nextInt
  def circles = []

  sg.stage(title: 'Vanishing Circles', show: true) {
    scene(fill: black, width: 800, height: 600) {
      50.times {
        circles << circle(centerX: ran
            radius: 150, stroke: white,
            strokeWidth: bind('hover',                    0})) {
          fill rgb(rand(255), rand(255), rand(255), 0.2)
          effect boxBlur(width: 10, height: 10, iterations: 3)
        }
      }
    }
  }
}
```

Declarative Stage definition

```
GroovyFX.start { primaryStage ->
  def sg = new SceneGraphBuilder()
  def rand = new Random().&nextInt
  def circles = []

  sg.stage(title: 'Vanishin
    scene(fill: black, width
      50.times {
        circles << circle(centerX: rand(800), centerY: rand(600),
            radius: 150, stroke: white,
            strokeWidth: bind('hover', converter: {val -> val ? 4 : 0})) {
          fill rgb(rand(255), rand(255), rand(255), 0.2)
          effect boxBlur(width: 10, height: 10, iterations: 3)
        }
      }
    }
  }
}
```

Inline property definitions

```
GroovyFX.start { primaryStage ->
  def sg = new SceneGraphBuilder()
  def rand = new Random().&nextInt
  def circles = []

  sg.stage(title: 'Vanishing Circles', show:
    scene(fill: black, width: 800, height: 6
      50.times {
        circles << circle(centerX: rand(800), centerY: rand(600),
            radius: 150, stroke: white,
            strokeWidth: bind('hover', converter: {val -> val ? 4 : 0})) {
          fill rgb(rand(255), rand(255), rand(255), 0.2)
          effect boxBlur(width: 10, height: 10, iterations: 3)
        }
      }
    }
  }
}
```

Bind to properties

```
GroovyFX.start { primaryStage ->
  def sg = new SceneGraphBuilder()
  def rand = new Random().&nextInt
  def circles = []

  sg.stage(title: 'Vanishing Circles', show
    scene(fill: black, width: 800, height:
      50.times {
        circles << circle(centerX: rand(800), centerY: rand(600),
            radius: 150, stroke: white,
            strokeWidth: bind('hover', converter: {val -> val ? 4 : 0})) {
          fill rgb(rand(255), rand(255), rand(255), 0.2)
          effect boxBlur(width: 10, height: 10, iterations: 3)
        }
      }
    }
  }
}
```

Sequence Creation Via Loop

Animation in GroovyFX

```
timeline(cycleCount: Timeline.INDEFINITE, autoReverse: true) {
  circles.each { circle ->
    at (40.s) {
      change circle.centerXProperty() to rand(800)
      change circle.centerYProperty() to rand(600)
    }
  }
}.play()
```

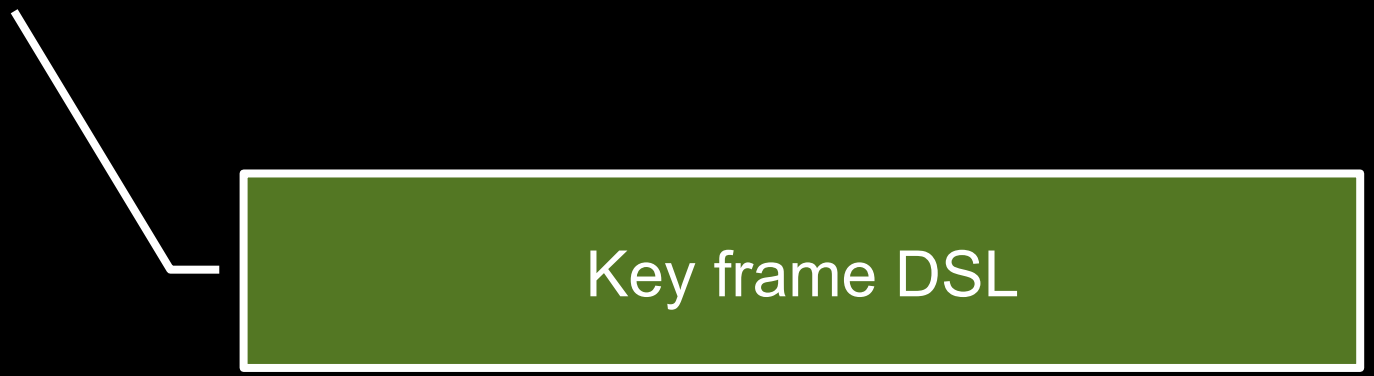
Animation in GroovyFX

```
timeline(cycleCount: Timeline.INDEFINITE, autoReverse: true) {
  circles.each { circle ->
    at (40.s) {
      change circle.centerXProperty() to rand(800)
      change circle.centerYProperty() to rand(600)
    }
  }
}.play()
```

Easy animation syntax:
at (duration) {keyframes}

Animation in GroovyFX

```
timeline(cycleCount: Timeline.INDEFINITE, autoReverse: true) {
  circles.each { circle ->
    at (40.s) {
      change circle.centerXProperty() to rand(800)
      change circle.centerYProperty() to rand(600)
    }
  }
}.play()
```



Animation in GroovyFX

```
timeline(cycleCount: Timeline.INDEFINITE, autoReverse: true) {
  circles.each { circle ->
    at (40.s) {
      change circle.centerXProperty() to rand(800) tween ease_both
      change circle.centerYProperty() to rand(600) tween linear
    }
  }
}.play()
```

Event Listeners in GroovyFX

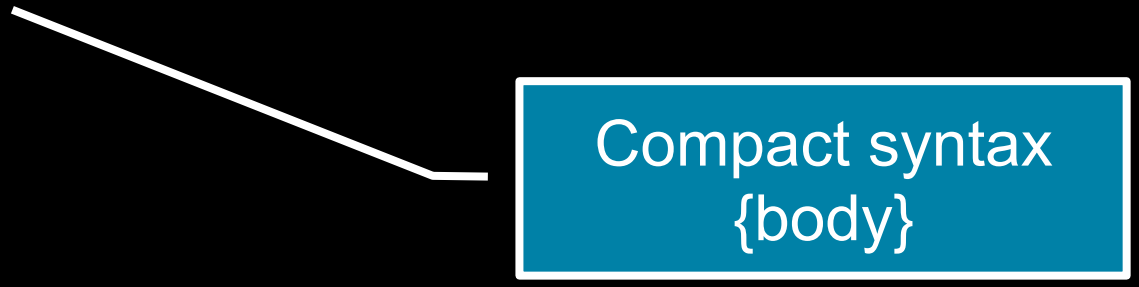
- Supported using the built-in Closure syntax
- Optional arguments for event objects

```
onMouseClicked { e ->
  timeline {
    at(3.s) { change e.source.radiusProperty() to 0 }
  }.play()
}
```

Event Listeners in GroovyFX

- Supported using the built-in Closure syntax
- Optional arguments for event objects

```
onMouseClicked { MouseEvent e ->
  timeline {
    at(3.s) { change e.source.radiusProperty() to 0 }
  }.play()
}
```



Event Listeners in GroovyFX

- Supported using the built-in Closure syntax
- Optional arguments for event objects

Optional event parameter
{event -> body}

```
onMouseClicked { MouseEvent e ->
  timeline {
    at(3.s) { change e.source.radiusProperty() to 0 }
  }.play()
}
```

But wait, there is more Grooviness…

Properties in Java

```
public class Person {
  private StringProperty firstName;
  public void setFirstName(String val) { firstNameProperty().set(val); }
  public String getFirstName() { return firstNameProperty().get(); }
  public StringProperty firstNameProperty() {
    if (firstName == null)
      firstName = new SimpleStringProperty(this, "firstName");
    return firstName;
  }

  private StringProperty lastName;
  public void setLastName(String value) { lastNameProperty().set(value); }
  public String getLastName() { return lastNameProperty().get(); }
  public StringProperty lastNameProperty() {
    if (lastName == null) // etc.
  }
}
```

Properties in GroovyFX

```
public class Person {
  @FXBindable String firstName;
  @FXBindable String lastName;
}
```

Properties in GroovyFX

```
public class Person {
   @FXBindable String firstName;
   @FXBindable String lastName = “Smith”;
}
```

TableView in Java

```
ObservableList<Person> items = ...
TableView<Person> tableView = new TableView<Person>(items);

TableColumn<Person,String> firstNameCol =
        new TableColumn<Person,String>("First Name");

firstNameCol.setCellValueFactory(
        new Callback<CellDataFeatures<Person, String>,
                     ObservableValue<String>>() {
  public ObservableValue<String> call(CellDataFeatures<Person, String> p)
  {
    return p.getValue().firstNameProperty();
  }
});

tableView.getColumns().add(firstNameCol);
```

TableView in GroovyFX

```
def dateFormat = new SimpleDateFormat("yyyy-MM-dd");

tableView(items: persons) {
  tableColumn property: "name",   text: "Name",   prefWidth: 150)
  tableColumn property: "age",    text: "Age",    prefWidth: 50)
  tableColumn property: "gender", text: "Gender", prefWidth: 150)
  tableColumn property: "dob",    text: "Birth",  prefWidth: 150,
              type: Date,
              converter: { from -> return dateFormat.format(from) })
}
```

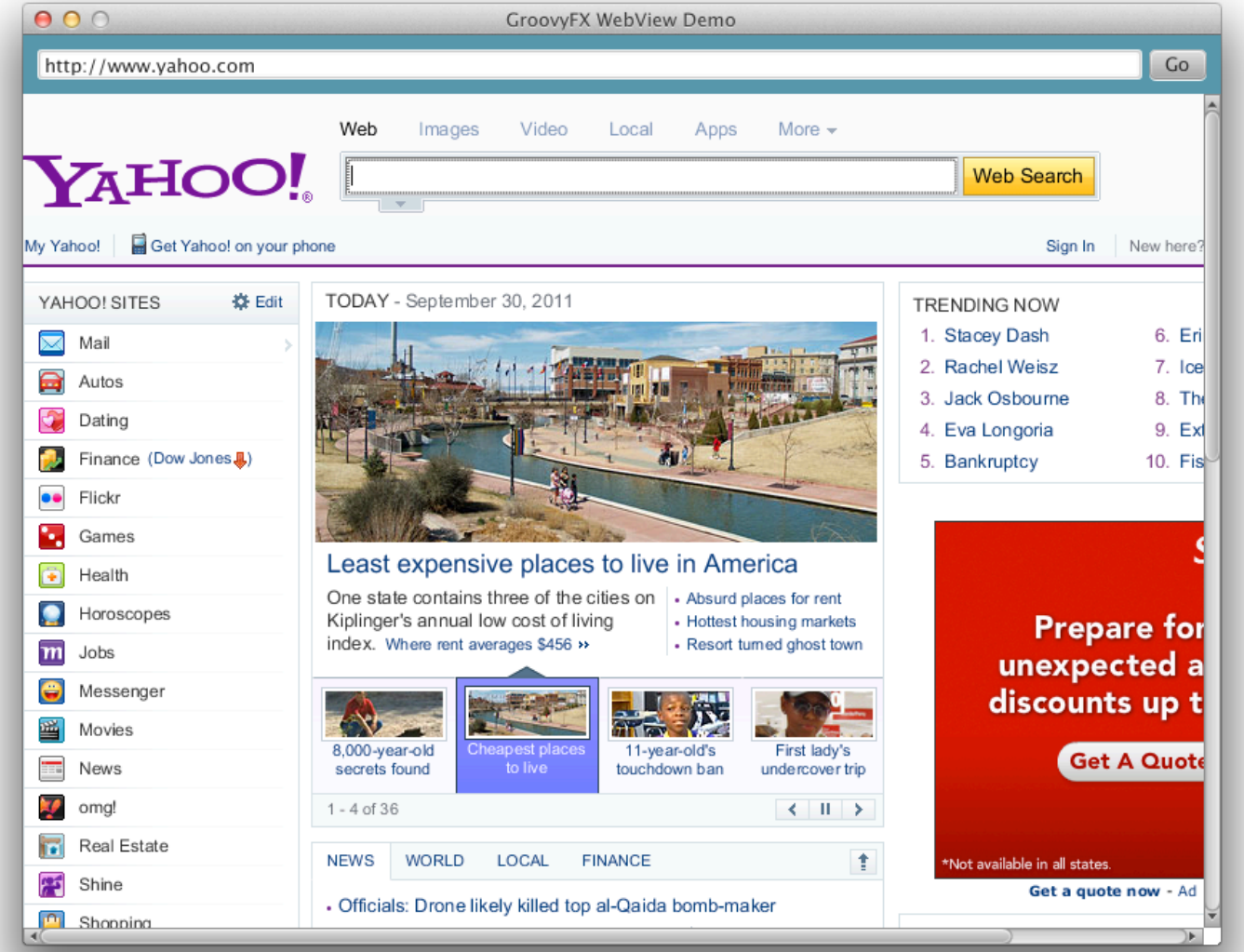
Layout in Java

```
TextField urlField = new TextField("http://www.google.com");
HBox.setHgrow(urlField, Priority.ALWAYS);

HBox hbox = new HBox();
hbox.getChildren().add(urlField);

WebView webView = new WebView();
VBox.setVgrow(webView, Priority.ALWAYS);

VBox vbox = new VBox();
vbox.getChildren().addAll(hbox, webView);
```

Layout in GroovyFX

```
sg.stage(title: "GroovyFX WebView Demo", show: true) {
    scene(fill: groovyblue, width: 1024, height: 800) {
        vbox {
            hbox(padding: 10, spacing: 5) {
                textField(“http://www.yahoo.com”, hgrow: "always")
                button("Go”)
            }
            webView vgrow: "always")
        }
    }
}
```

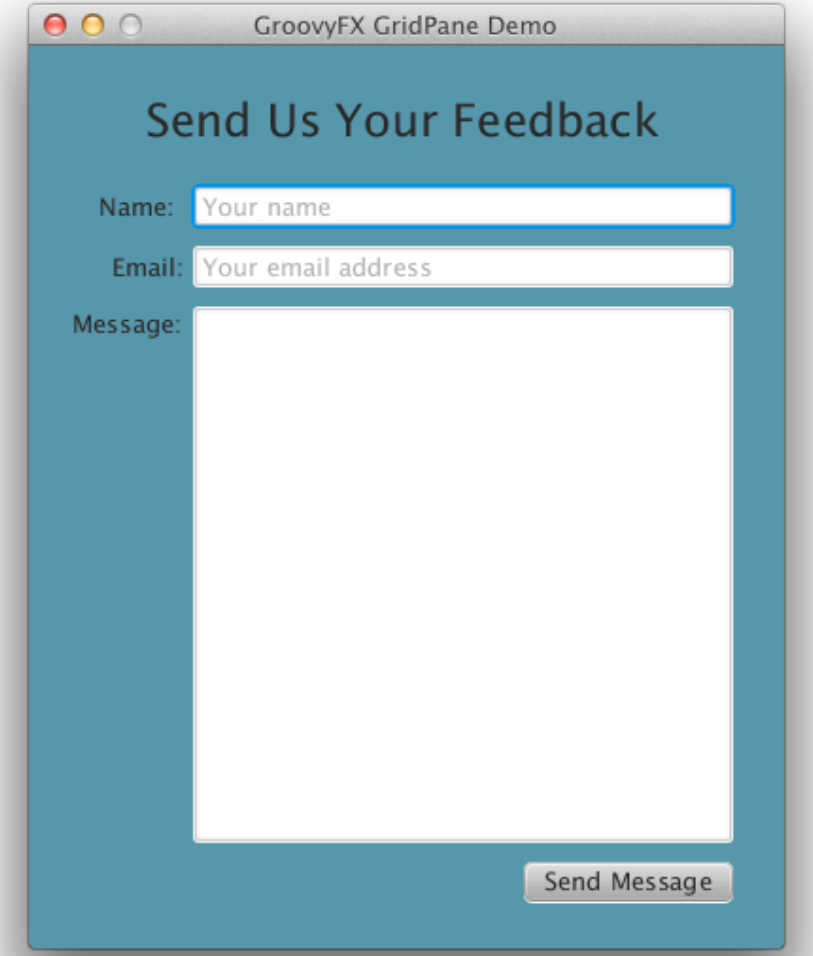
Layout in GroovyFX

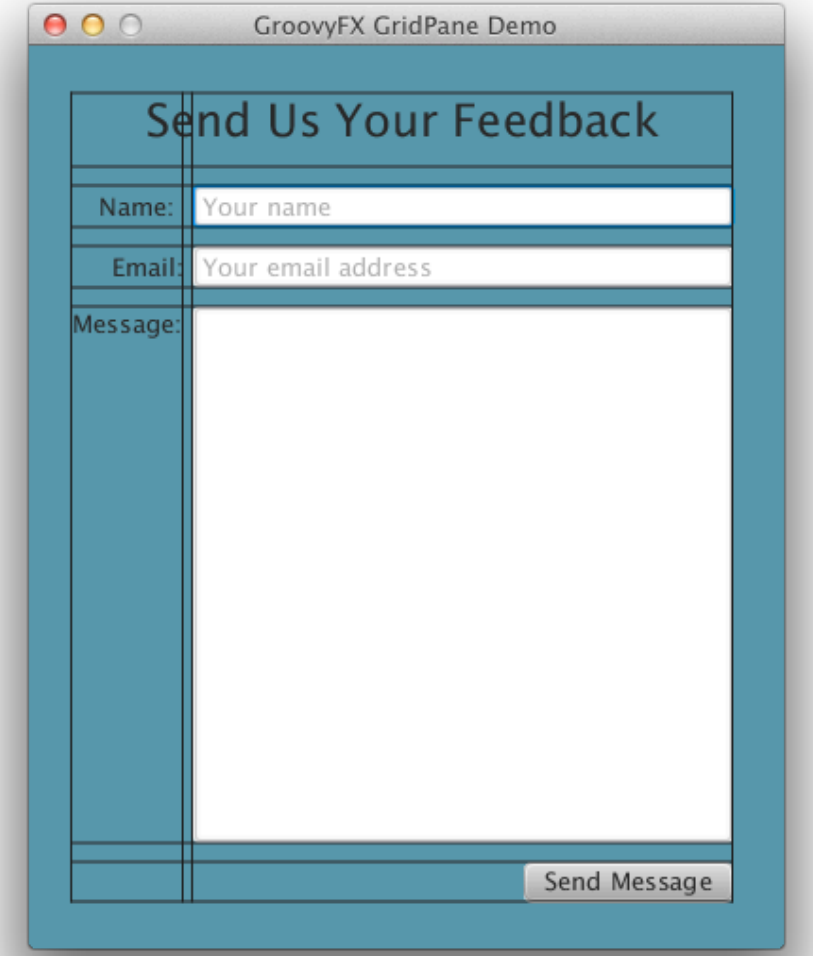


Layout in GroovyFX

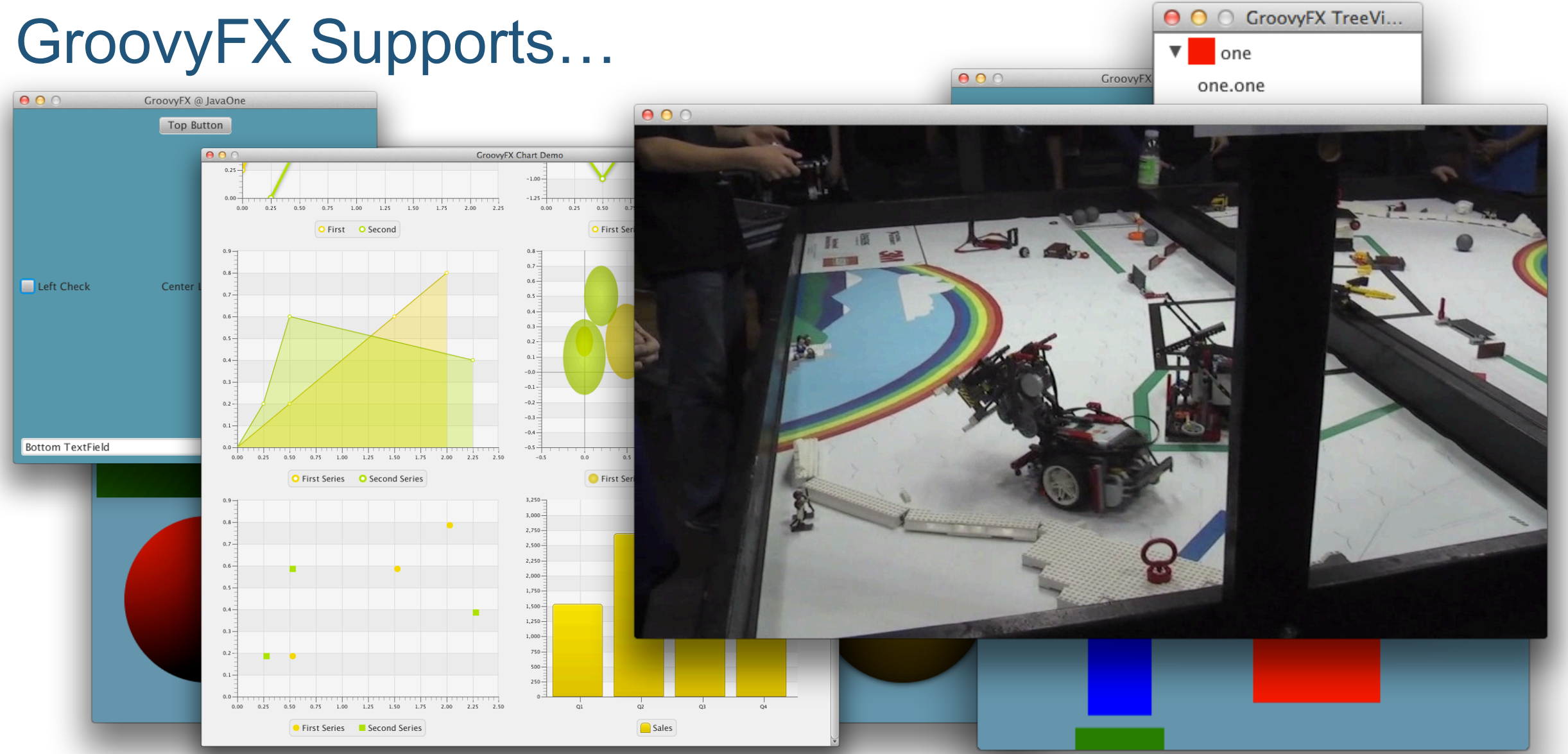
```
gridPane(hgap: 5, vgap: 10, padding: 25) {
  columnConstraints(minWidth: 50, halignment: "right")
  columnConstraints(prefWidth: 250)
  label("Send Us Your Feedback", font: "24pt sanserif",
        row: 0, columnSpan: GridPane.REMAINING, halignment: "center",
        margin: [0, 0, 10])

  label("Name: ", row: 1, column: 0)
  textField(promptText: "Your name", row: 1, column: 1, hgrow: 'always')

  label("Email:", row: 2, column: 0)
  textField(promptText: "Your email", row: 2, column: 1, hgrow: 'always')

  label("Message:", row: 3, column: 0, valignment: "baseline")
  textArea row: 3, column: 1, hgrow: "always", vgrow: "always")

  button("Send Message", row: 4, column: 1, halignment: "right")
}
```

Layout in GroovyFX

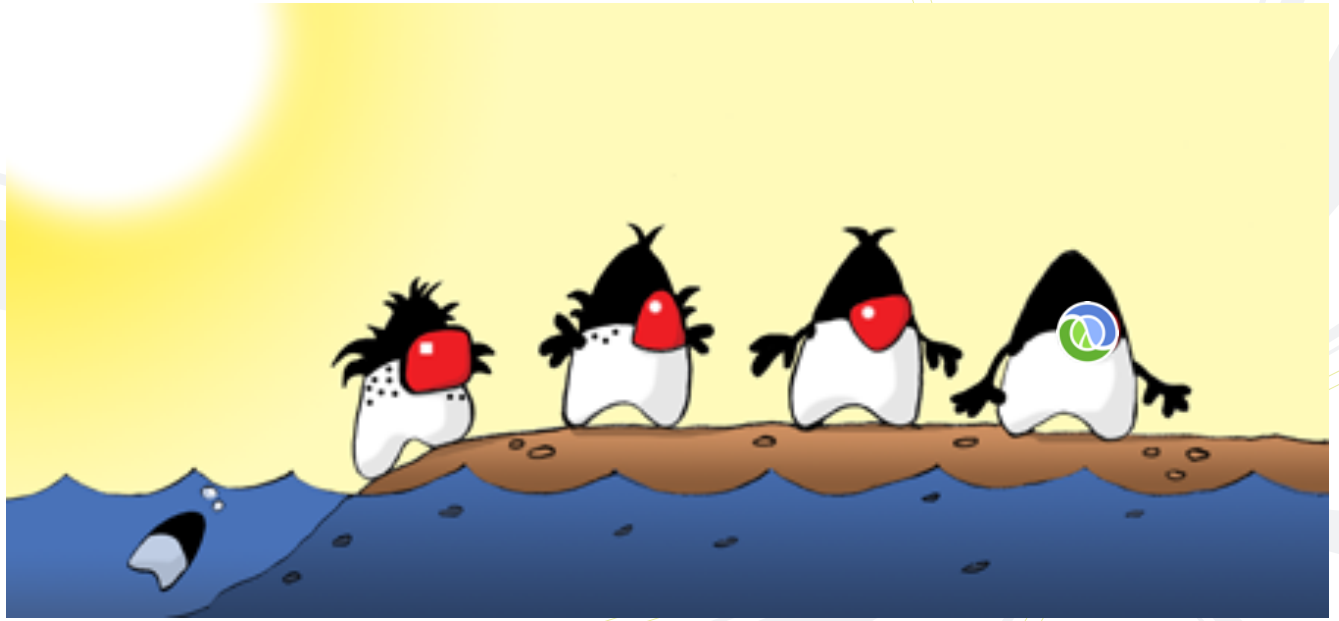




GroovyFX Supports…



JavaFX With Clojure



Artwork by Augusto Sellhorn http://sellmic.com/

A Little About Clojure

- Started in 2007 by Rich Hickey
- Functional Programming Language
- Derived from LISP
- Optimized for High Concurrency

```
(def hello (fn [] "Hello world"))
(hello)
```

- … and looks nothing like Java!

Clojure Syntax in One Slide

Symbols

- numbers – 2.178
- ratios – 355/113
- strings – “clojure”, “rocks”
- characters – \a \b \c \d
- symbols – a b c d
- keywords – :alpha :beta
- boolean – true, false
- null - nil

Collections

(commas optional)

- Lists

(1, 2, 3, 4, 5)

- Vectors

[1, 2, 3, 4, 5]

- Maps

{:a 1, :b 2, :c 3, :d 4}

- Sets

#{:a :b :c :d :e}

(plus macros that are syntactic sugar wrapping the above)

Clojure GUI Example

```
(defn javafxapp []
  (let [stage (Stage. "JavaFX Stage")
        scene (Scene.)]
    (.setFill scene Color/LIGHTGREEN)
    (.setWidth stage 600)
    (.setHeight stage 450)
    (.setScene stage scene)
    (.setVisible stage true)))
(javafxapp)
```

Refined Clojure GUI Example

```
(defn javafxapp []
  (doto (Stage. "JavaFX Stage")
    (.setWidth 600)
    (.setHeight 450)
    (.setScene (doto (Scene.)
      (.setFill Color/LIGHTGREEN)
      (.setContent (list (doto (Rectangle.)
        (.setX 25)
        (.setY 40)
        (.setWidth 100)
        (.setHeight 50)
        (.setFill Color/RED))))))
    (.setVisible true)))
(javafxapp)
```

Refined Clojure GUI Example

```
(defn javafxapp []
  (doto (Stage. "JavaFX Stage")
    (.setWidth 600)
    (.setHeight 450)
    (.setScene (doto (Scene.)
      (.setFill Color/LIGHTGREEN)
      (.setContent (list (doto (Rectangle.)
        (.setX 25)
        (.setY 40)
        (.setWidth 100)
        (.setHeight 50)
        (.setFill Color/RED))))))
    (.setVisible true)))
(javafxapp)
```

Doto allows nested data structures

Closures in Clojure

- Inner classes can be created using proxy

```
(.addListener hoverProperty
  (proxy [ChangeListener] []
    (handle [p, o, v]
      (.setFill rect
        (if (.isHover rect) Color/GREEN Color/RED)))))
```

Closures in Clojure

- Inner classes can be created using proxy

Proxy form:

```
(proxy [class] [args] fs+)
f => (name [params*] body)
```

```
(.addListener hoverProperty
  (proxy [ChangeListener] []
    (handle [p, o, v]
      (.setFill rect
        (if (.isHover rect) Color/GREEN Color/RED)))))
```

JavaFX With Scala

What is Scala

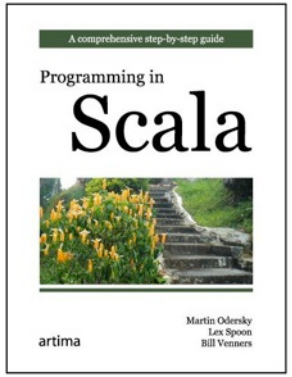
2001
- Scala Started

2003/2004
- Scala v1.0

2006
- Scala v2.0

2011
- Scala 2.9.2 (latest)

- Started in 2001 by Martin Odersky
- Compiles to Java bytecodes
- Pure object-oriented language
- Also a functional programming language



Java vs. Scala DSL

```
public class VanishingCircles extends Application {

  public static void main(String[] args) {
    Application.launch(args);
  }

  @Override
  public void start(Stage primaryStage) {
    primaryStage.setTitle("Vanishing Circles");
    Group root = new Group();
    Scene scene = new Scene(root, 800, 600, Color.BLACK);
    List<Circle> circles = new ArrayList<Circle>();
    for (int i = 0; i < 50; i++) {
      final Circle circle = new Circle(150);
      circle.setCenterX(Math.random() * 800);
      circle.setCenterY(Math.random() * 600);
      circle.setFill(new Color(Math.random(), Math.random(), Math.random(), .2));
      circle.setEffect(new BoxBlur(10, 10, 3));
      circle.addEventHandler(MouseEvent.MOUSE_CLICKED, new EventHandler<MouseEvent>() {
        public void handle(MouseEvent e) {
          KeyValue kv = new KeyValue(circle.radiusProperty(), 0);
          new Timeline(new KeyFrame(Duration.seconds(3), kv)).play();
        }
      });
      circle.setStroke(Color.WHITE);
      circle.strokeWidthProperty().bind(Bindings.when(circle.hoverProperty())
        .then(4)
        .otherwise(0));
      circles.add(circle);
    }
    root.getChildren().addAll(circles);
    primaryStage.setScene(scene);
    primaryStage.show();

    Timeline moveCircles = new Timeline();
    for (Circle circle : circles) {
      KeyValue moveX = new KeyValue(circle.centerXProperty(), Math.random() * 800);
      KeyValue moveY = new KeyValue(circle.centerYProperty(), Math.random() * 600);
      moveCircles.getKeyFrames().add(new KeyFrame(Duration.seconds(40), moveX, moveY));
    }
    moveCircles.play();
  }
}
```

40 Lines
1299 Characters

```
object VanishingCircles extends JFXApp {
  var circles: Seq[Circle] = null
  stage = new Stage {
    title = "Vanishing Circles"
    width = 800
    height = 600
    scene = new Scene {
      fill = BLACK
      circles = for (i <- 0 until 50) yield new Circle {
        centerX = random * 800
        centerY = random * 600
        radius = 150
        fill = color(random, random, random, .2)
        effect = new BoxBlur(10, 10, 3)
        strokeWidth = when(hover) then 4 otherwise 0
        stroke = WHITE
        onMouseClicked = {
          Timeline(at (3 s) {radius -> 0}).play()
        }
      }
      content = circles
    }
  }

  new Timeline {
    cycleCount = INDEFINITE
    autoReverse = true
    keyFrames = for (circle <- circles) yield at (40 s) {
      Set(
        circle.centerX -> random * stage.width,
        circle.centerY -> random * stage.height
      )
    }
  }.play();
}
```

33 Lines
591 Characters

```
object VanishingCircles extends JFXApp {
  stage = new Stage {
    title = "Disappearing Circles"
    width = 800
    height = 600
    scene = new Scene {
      fill = BLACK
      children = for (i <- 0 until 50) yield new Circle {
        centerX = random * 800
        centerY = random * 600
        radius = 150
        fill = color(random, random, random, 0.2)
        effect = new BoxBlur(10, 10, 3)
      }
    }
  }
}
```

```
object VanishingCircles extends JFXApp {
  stage = new Stage {
    title = "Disappearing Circles"
    width
    heigh
    scene
      fill = BLACK
      children = for (i <- 0 until 50) yield new Circle {
        centerX = random * 800
        centerY = random * 600
        radius = 150
        fill = color(random, random, random, 0.2)
        effect = new BoxBlur(10, 10, 3)
      }
    }
  }
}
```

Base class for JavaFX applications

```
object VanishingCircles extends JFXApp {
  stage = new Stage {
    title = "Disappearing Circles"
    width = 800
    height = 600
    scene = new Scene {
      fill = BLACK
      children = for (i <- 0 until 50) yield new Circle {
        centerX = random * 800
        centerY = random * 600
        radius = 150
        fill = color(random, random, random, 0.2)
        effect = new BoxBlur(10, 10, 3)
      }
    }
  }
}
```

Declarative Stage definition

```
object VanishingCircles extends JFXApp {
  stage = new Stage {
    title = "Disappearing Circles"
    width = 800
    height = 600
    scene = new Scene {
      fill = BLACK
      children = for (i <- 0 until 50) yield new Circle {
        centerX = random * 800
        centerY = random * 600
        radius = 150
        fill = color(random, random, random, 0.2)
        effect = new BoxBlur(10, 10, 3)
      }
    }
  }
}
```

Inline property definitions

```
object VanishingCircles extends JFXApp {
  stage = new Stage {
    title = "Disappearing Circles"
    width = 800
    height = 600
    scene = new Scene {
      fill = BLACK
      children = for (i <- 0 until 50) yield new Circle {
        centerX = random * 800
        centerY = random * 600
        radius = 150
        fill = color(random, random, random, 0.2)
        effect = new BoxBlur(10, 10, 3)
      }
    }
  }
}
```

Sequence Creation Via Loop

Binding in Scala

Infix Addition/Subtraction/Multiplication/Division:

```
height <== rect1.height + rect2.height
```

Aggregate Operators:

```
width <== max(rect1.width, rect2.width, rect3.width)
```

Conditional Expressions:

```
strokeWidth <== when (hover) then 4 otherwise 0
```

Compound Expressions:

```
text <== when (rect.hover || circle.hover && !disabled) then
  textField.text + " is enabled" otherwise "disabled"
```

Animation in Scala

```
val timeline = new Timeline {
  cycleCount = INDEFINITE
  autoReverse = true
  keyFrames = for (circle <- circles) yield at (40 s) {
    Set(
      circle.centerX -> random * stage.width,
      circle.centerY -> random * stage.height
    )
  }
}
timeline.play();
```

Animation in Scala

JavaFX Script-like animation syntax: at (duration) {keyframes}

```
val timeline = new Timeline {
  cycleCount = INDEFINITE
  autoReverse = true
  keyFrames = for (circle <- circles) yield at (40 s) {
    Set(
      circle.centerX -> random * stage.width,
      circle.centerY -> random * stage.height
    )
  }
}
timeline.play();
```

Animation in Scala

```
val timeline = new Timeline {
  cycleCount = INDEFINITE
  autoReverse = true
  keyFrames = for (circle <- circles) yield at (40 s) {
    Set(
      circle.centerX -> random * stage.width,
      circle.centerY -> random * stage.height
    )
  }
}
timeline.play();
```

Operator overloading for animation syntax

Animation in Scala

```
val timeline = new Timeline {
  cycleCount = INDEFINITE
  autoReverse = true
  keyFrames = for (circle <- circles) yield at (40 s) {
    Set(
 circle.centerX -> random * stage.width tween EASE_BOTH,
 circle.centerY -> random * stage.height tween EASE_IN
    )
  }
}
timeline.play();
```

Optional tween syntax

Event Listeners in Scala

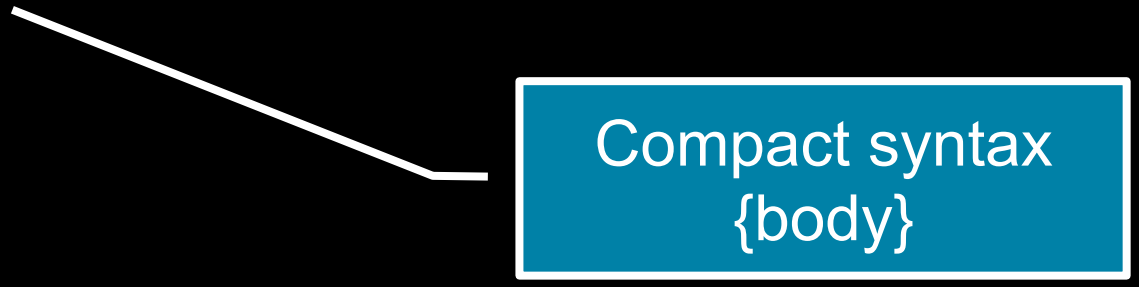
- Supported using the built-in Closure syntax
- Arguments for event objects
- 100% type-safe

```
onMouseClicked = { (e: MouseEvent) =>
  Timeline(at(3 s){radius->0}).play()
}
```

Event Listeners in Scala

- Supported using the built-in Closure syntax
- Arguments for event objects
- 100% type-safe

```
onMouseClicked = { (e: MouseEvent) =>
  Timeline(at(3 s){radius->0}).play()
}
```



Event Listeners in Scala

- Supported using the built-in Closure syntax
- Arguments for event objects
- 100% type-safe

Event parameter
{(event) => body}

```
onMouseClicked = { (e: MouseEvent) =>
  Timeline(at(3 s){radius->0}).play()
}
```

TableView in ScalaFX

```
def dateFormat = new SimpleDateFormat("yyyy-MM-dd")
new TableView[Speaker](persons) {
  columns = Seq(
    new TableColumn[Speaker, String] {
      text: "Name"
      converter = {_.firstName}
    } new TableColumn[Speaker, String] {
      text: "Age"
      converter = {_.age}
    } new TableColumn[Speaker, String] {
      text: "Gender"
      converter = {_.gender}
    } new TableColumn[Speaker, String] {
      text: "Birth"
      converter = {dateFormat.format(_.dob)},
    }
)}
```

JavaFX With Visage

About Project Visage

- ***"Visage is a domain specific language (DSL) designed for the express purpose of writing user interfaces."***

- Visage project goals:
  - Compile to JavaFX Java APIs
  - Evolve the Language (Annotations, Maps, etc.)
  - Support Other Toolkits

- Come join the team!
- For more info: http://visage-lang.org/

Java vs. Visage DSL

```
public class VanishingCircles extends Application {

  public static void main(String[] args) {
    Application.launch(args);
  }

  @Override
  public void start(Stage primaryStage) {
    primaryStage.setTitle("Vanishing Circles");
    Group root = new Group();
    Scene scene = new Scene(root, 800, 600, Color.BLACK);
    List<Circle> circles = new ArrayList<Circle>();
    for (int i = 0; i < 50; i++) {
      final Circle circle = new Circle(150);
      circle.setCenterX(Math.random() * 800);
      circle.setCenterY(Math.random() * 600);
      circle.setFill(new Color(Math.random(), Math.random(), Math.random(), .2));
      circle.setEffect(new BoxBlur(10, 10, 3));
      circle.addEventHandler(MouseEvent.MOUSE_CLICKED, new EventHandler<MouseEvent>() {
        public void handle(MouseEvent e) {
          KeyValue kv = new KeyValue(circle.radiusProperty(), 0);
          new Timeline(new KeyFrame(Duration.seconds(3), kv)).play();
        }
      });
      circle.setStroke(Color.WHITE);
      circle.strokeWidthProperty().bind(Bindings.when(circle.hoverProperty())
        .then(4)
        .otherwise(0));
      circles.add(circle);
    }
    root.getChildren().addAll(circles);
    primaryStage.setScene(scene);
    primaryStage.show();

    Timeline moveCircles = new Timeline();
    for (Circle circle : circles) {
      KeyValue moveX = new KeyValue(circle.centerXProperty(), Math.random() * 800);
      KeyValue moveY = new KeyValue(circle.centerYProperty(), Math.random() * 600);
      moveCircles.getKeyFrames().add(new KeyFrame(Duration.seconds(40), moveX, moveY));
    }
    moveCircles.play();
  }
}
```

40 Lines
1299 Characters

```
var circles:Circle[];
Stage {
  title: "Vanishing Circles"
  Scene {
    width: 800
    height: 600
    fill: BLACK
    Group {
      circles = for (i in [1..50]) {
        def c:Circle = Circle {
          centerX: random() * 800
          centerY: random() * 600
          radius: 150
          fill: Color.color(random(), random(), random(), .2)
          effect: BoxBlur {
            height: 10
            width: 10
            iterations: 3
          }
          stroke: bind if (c.hover) Color.WHITE else null
          strokeWidth: bind if (c.hover) 4 else 0
          onMouseClicked: function(e) {
            Timeline {at (3s) {c.radius => 0}}.play()
          }
        }
      }
    }
  }
}

Timeline {
  for (circle in circles) at (40s) {
    circle.centerX => random() * 800;
    circle.centerY => random() * 600
  }
}.play()
```

35 Lines
487 Characters

How about JavaFX on… Visage

```
Stage {
  title: "Vanishing Circles"
  scene: Scene {
    width: 800
    height: 600
    fill: BLACK
    content: Group {
      circles = for (i in [1..50]) {
        Circle {
          centerX: random() * 800
          centerY: random() * 600
        }
      }
    }
  }
}
```

How about JavaFX on… Visage

```
Stage {
  title: "Vanishing Circles"
  scene: Scene {
    width: 800
    height: 600
    fill: BLACK
    content: Group {
      circles = for (i in [1..50]) {
        Circle {
          centerX: random() * 800
          centerY: random() * 600
        }
      }
    }
  }
}
```

How about JavaFX on… Visage

```
Stage {
  title: "Vanishing Circles"
  Scene {
    width: 800
    height: 600
    fill: BLACK
    Group {
      circles = for (i in [1..50]) {
        Circle {
          centerX: random() * 800
          centerY: random() * 600
        }
      }
    }
  }
}
```

Visage is JavaFX Script++

- Default Parameters
- New Literal Syntax For:
  - Angles – `35deg, 4rad, 1turn`
  - Colors – `#DDCCBB, #AA33AA|CC`
  - Lengths – `5px, 2pt, 3in, 4sp`
- Null-check Dereference
  - var width = rect.!width
- Built-in Bindable Maps (coming soon!)
  - var fruitMap = ["red" : apple, "yellow" : banana]
  - var fruit = bind fruitMap["red"]

Visage and JavaFX 2.0 are made for each other…

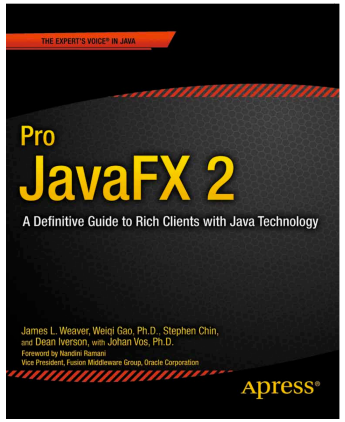
- Enhanced Binding
  - Retains lazy evaluation properties with additional expressive power
- Integrated Collections
  - Sequences and Maps automatically convert between JavaFX Observable Lists/Maps
- Built-in Animation Syntax
  - Ties into JavaFX animation subsystem
  - Provides consistent, clean APIs

Other JVM Languages to Try

- JRuby
  - Faithful to Ruby language with the power of the JVM
- Gosu
  - Up and coming language created at GuideWire
  - Easy to enhance libraries and create DSLs
- Mirah
  - Invented by Charles Nutter
  - Local Type Inference, Static and Dynamic Typing
- Fantom
  - Created by Brian and Andy Frank
  - Portable to Java and .NET
  - Local Type Inference, Static and Dynamic Typing

Conclusion

- You can write JavaFX applications in pure Java
- JavaFX is also usable in alternate languages
- You can get improved support using DSL libraries
  - GroovyFX
  - ScalaFX
- Or a dedicated UI JVM Language
  - Visage



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Thanks to Dean Iverson and Jonathan Giles for help preparing this talk